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Helping Utilities Make Smart Solar Decisions

Solar Market Drivers

From a Utility Perspective

January 10, 2013

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Solar Electric Power Association

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About SEPA

Educational non-profit (501 c3)

- Celebrating 20 years of service to utilities and solar
- Membership based - 1,000+ members
- Providing unbiased information focused on supporting utilities and their needs as they relate to solar adoption
- Providing exclusive member programming, research, education, collaboration and consulting services

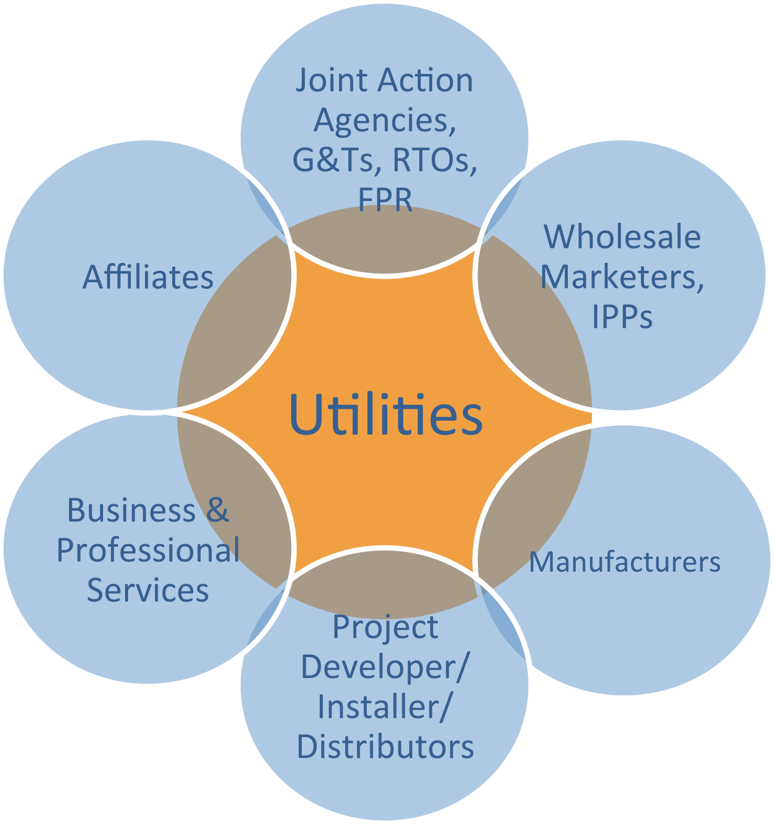
Membership

420+ Utility

500+ solar industry & stakeholder

52% of electricity customers

+90% of installed solar capacity



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Sampling of Members

PG&E

SDGE connected

A Sempra Energy utility

aps

SOUTHERN CALIFORNIA EDISON

An EDISON INTERNATIONAL Company

cps ENERGY

conEdison

GEORGIA POWER

A SOUTHERN COMPANY

Xcel Energy

RESPONSIBLE BY NATURE

we

Energy You Can Depend On

pepco

NIPSCO 100 YEARS 1912 2012

Duke Energy

Dominion

PSE PUGET SOUND ENERGY

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The Utility Solar Interface

SEPA's unique mission is aimed at utility issues …

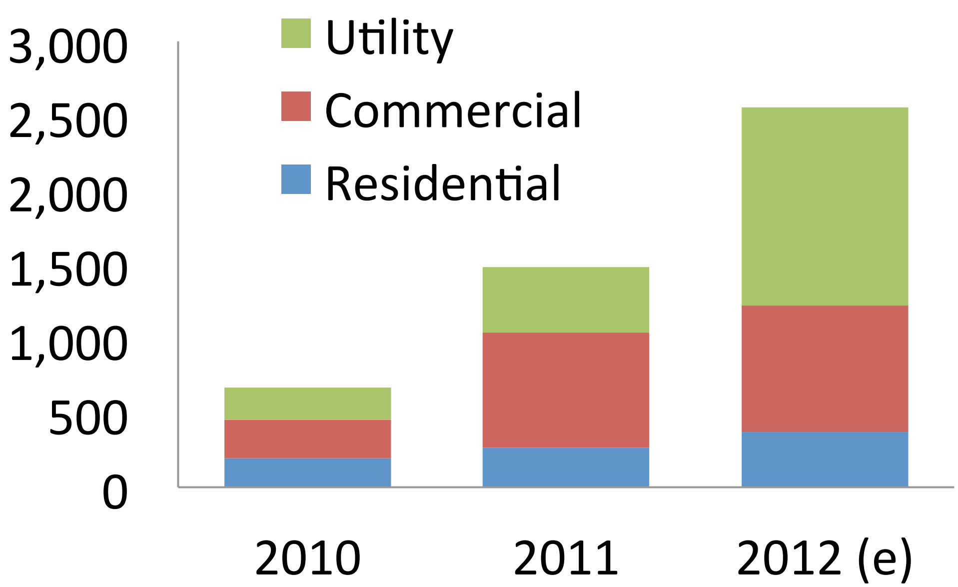
- Resource planning and solar strategy diversity
- Organization design and accountability
- Information technology, data management and analytics
- Solar integration and forecasting
- Customer programs, design, support and communication
- Integration, operation and maintenance
- Distribution system impacts, mitigation and planning

…delivered through tailored education, publications, best practices and consultation

U.S. PV Capacity Growth

Growth in PV Dominated in RPS States

Incremental Annual MW (AC)



Source: 2010 & 2011 – SEPA; 2012 data – GTM Research

Top Utilities (2011):

PG&E (CA) – 288 MW-ac
PSEG (NJ) – 181 MW-ac
APS (AZ) – 144 MW-ac
SCE (CA) – 139 MW-ac
ACE (NJ) – 61 MW-ac

Top Utilities (Through 2011):

PG&E (CA) – 762 MW-ac
SCE (CA) – 741 MW-ac
PSEG (NJ) – 299 MW-ac
APS (AZ) – 198 MW-ac
Xcel (CO) – 136 MW-ac

Cumulative 2012 (e): 6200 MW-ac

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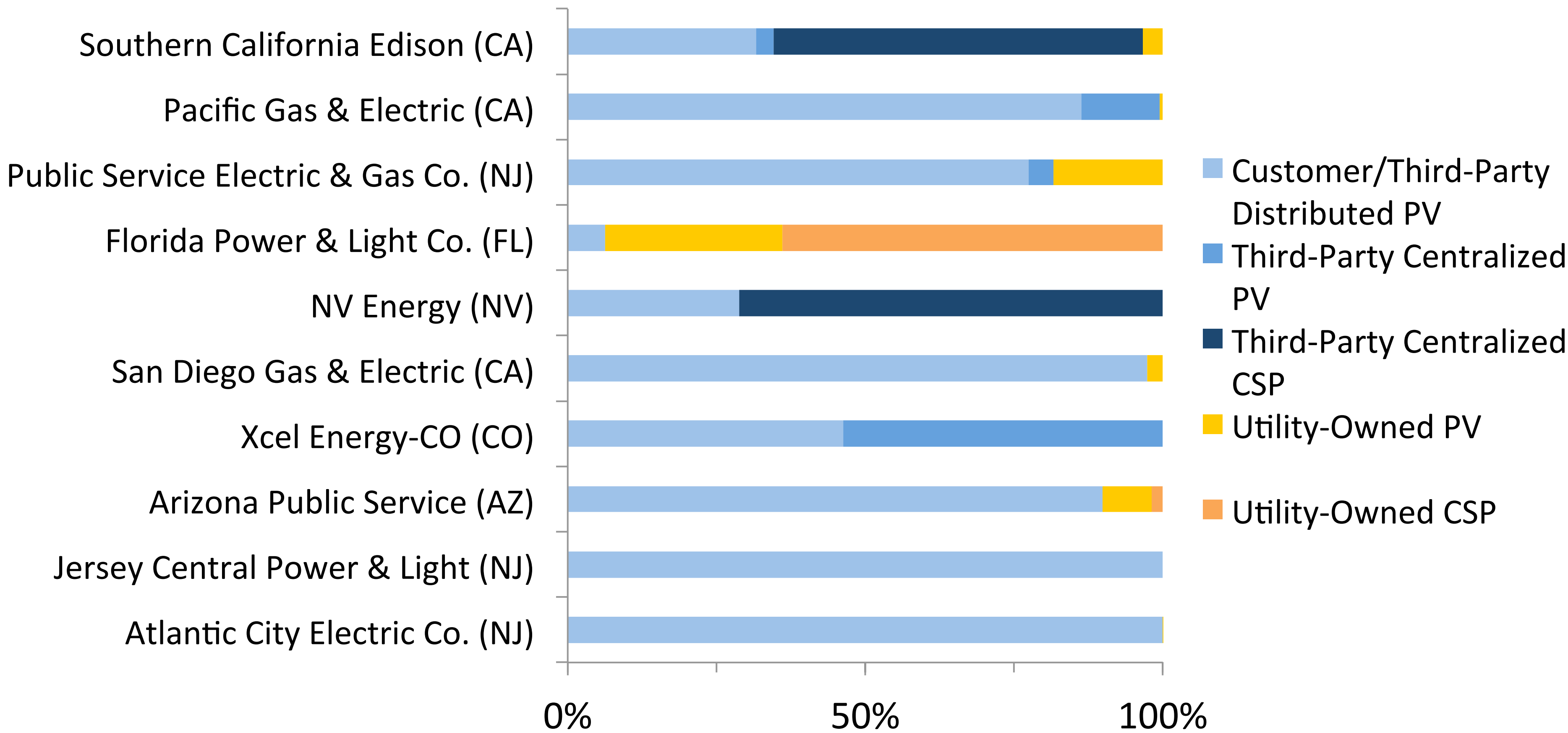
Utility Portfolios – In Service

Distributed PV Fills Many Utility Portfolios



Source: SEPA Top 10 Annual Report

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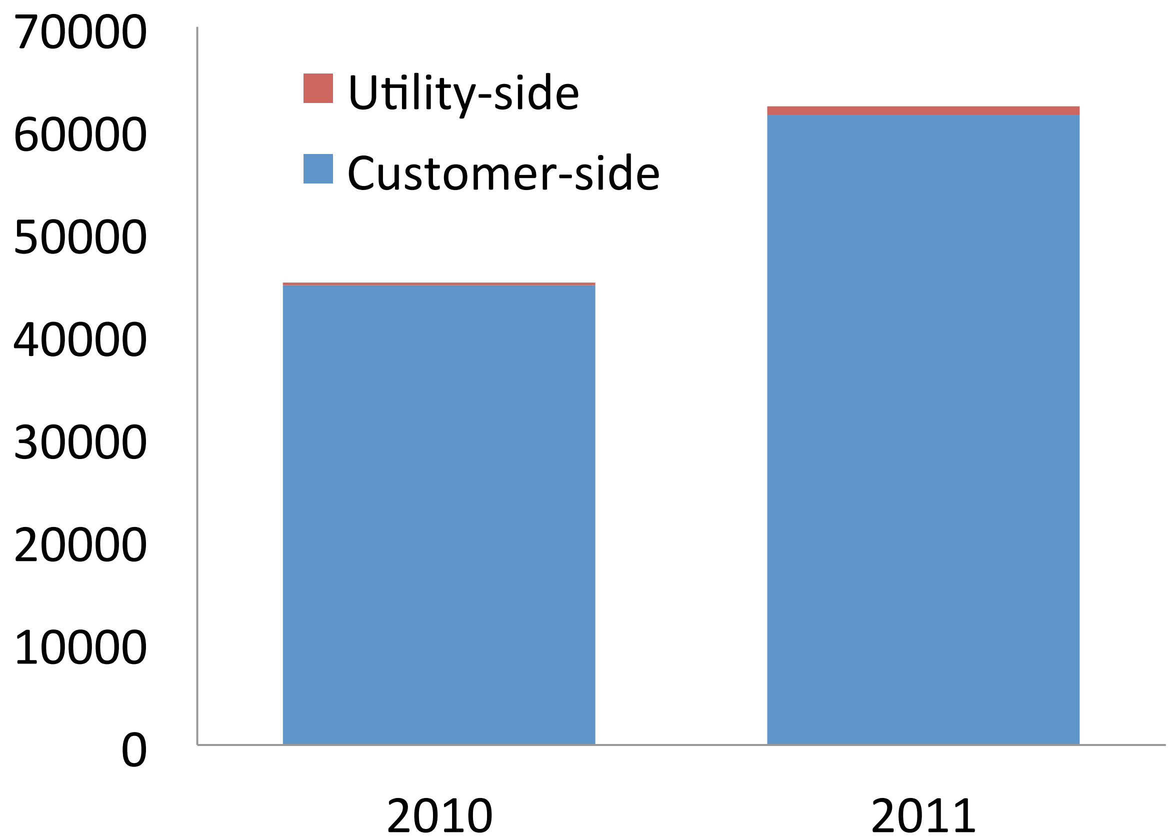
of Systems



Top Utilities (2011):
PG&E (CA) – 13,621
SCE (CA) – 9,915
SDG&E (CA) – 4,016
APS (AZ) – 3,661
HECO (HI) – 3,460

22 utilities > 500

Cumulative 2012 (e): 275,000+

Source: SEPA

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Penetration Rate

Cumulative # of Solar Systems per 1,000 Customers

'11	'10	Utility	#
1	4	Maui Electric Co. (HI)	29.3
2	6	Hawaiian Electric Co. (HI)	23.0
3	1	Roseville Electric (CA)	21.8
4	7	Hawaii Electric Light Co. (HI)	20.6
5	11	Kauai Island Utility Co-op (HI)	19.9
6	2	Verendrye Electric Co-op (ND)	19.0
7	3	City of Palo Alto Utilities (CA)	16.1
8	NR	Healdsburg Electric Department (CA)	13.6
9	5	Sulphur Springs Valley Electric Co-op (AZ)	13.5
10	9	Pacific Gas & Electric (CA)	11.6

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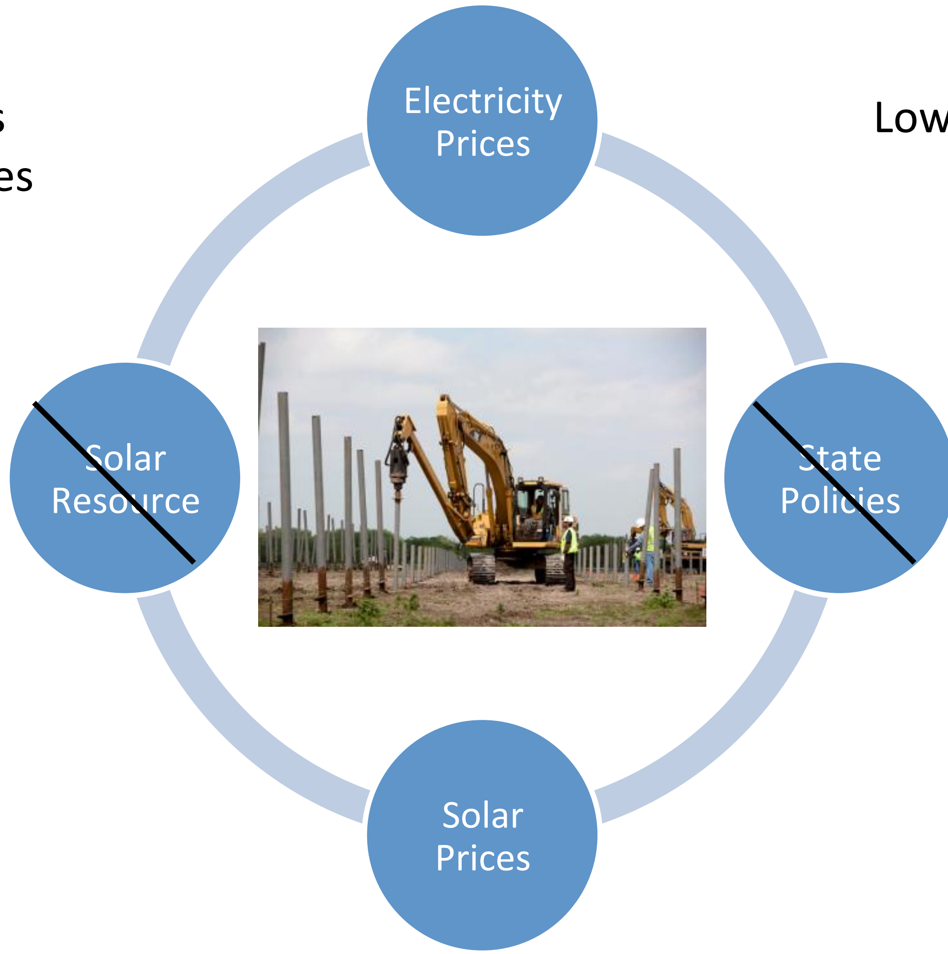
Solar Value

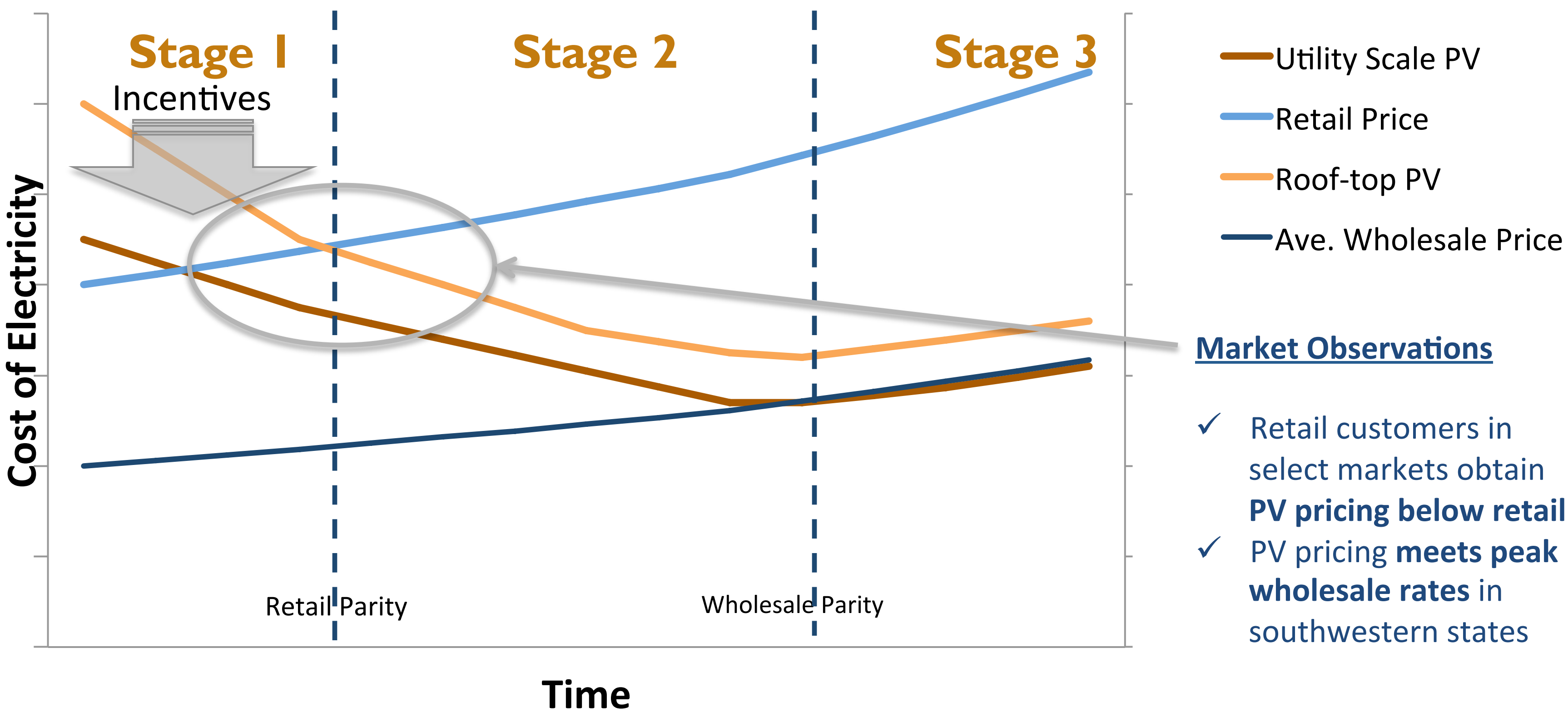
Customers:
Higher retail prices
Smaller system sizes
Higher solar costs

Utilities:
Lower wholesale prices
Larger system sizes
Lower solar costs



PV Cost Inflection Points

Transitioning from Stage 1 to 2



Market Observations

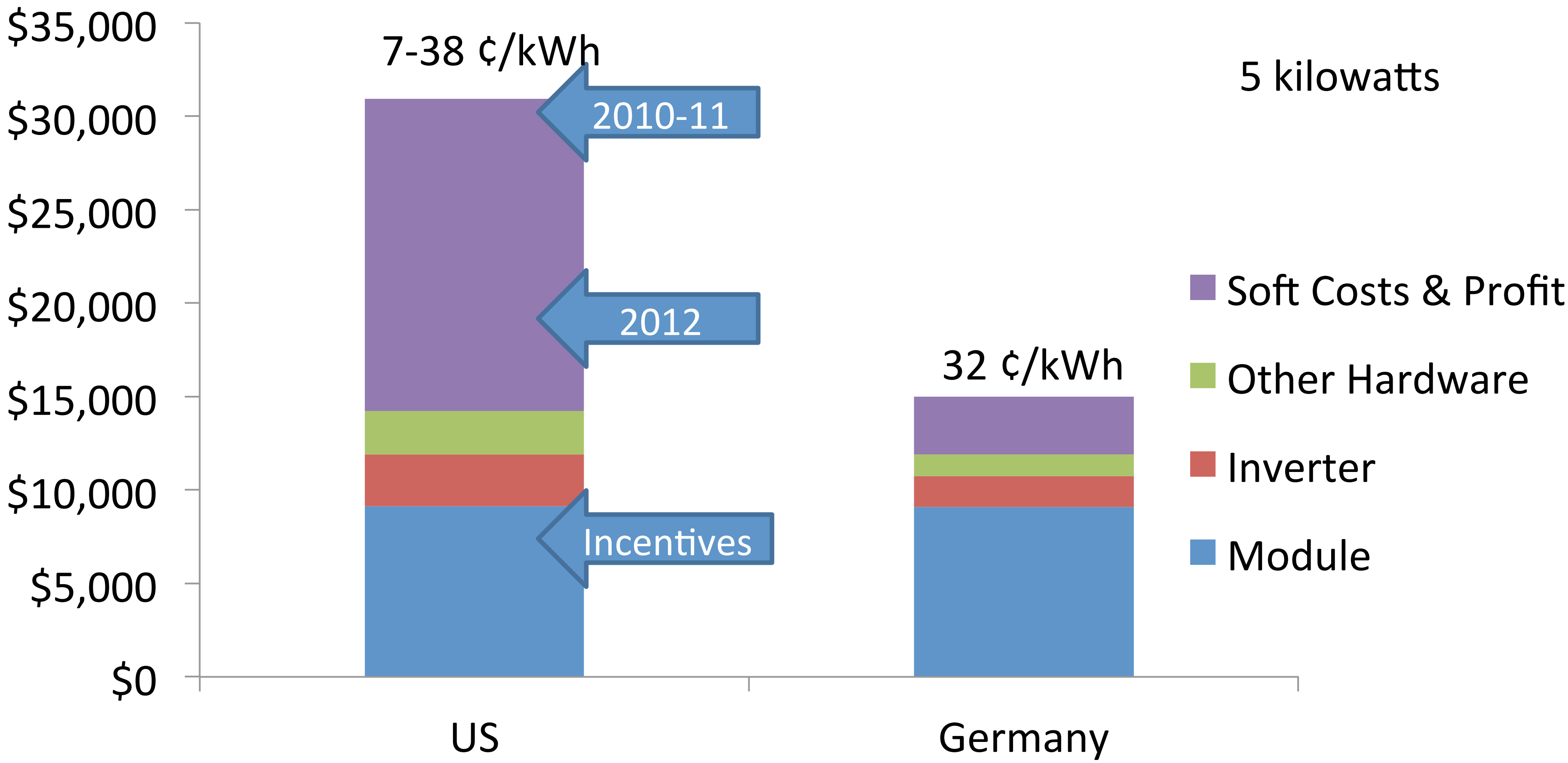
- ✓ Retail customers in select markets obtain **PV pricing below retail**
- ✓ PV pricing **meets peak wholesale rates** in southwestern states

The difference between wholesale and retail pricing is largely a reflection of utility generation, transmission and distribution infrastructure fixed cost recovery

Market Changes

Customer Market	Utility Market
Lower Solar Prices	Lower Solar Prices
Rising Electricity Rates	Avoided Costs / Fuels
Incentives	Risk Assessment
More Solar Options	Business Opportunity

Residential Prices



Source: Seel, Barbose, & Wiser, "Why are Residential PV Prices in Germany So Much Lower Than in the United States," September, 2012

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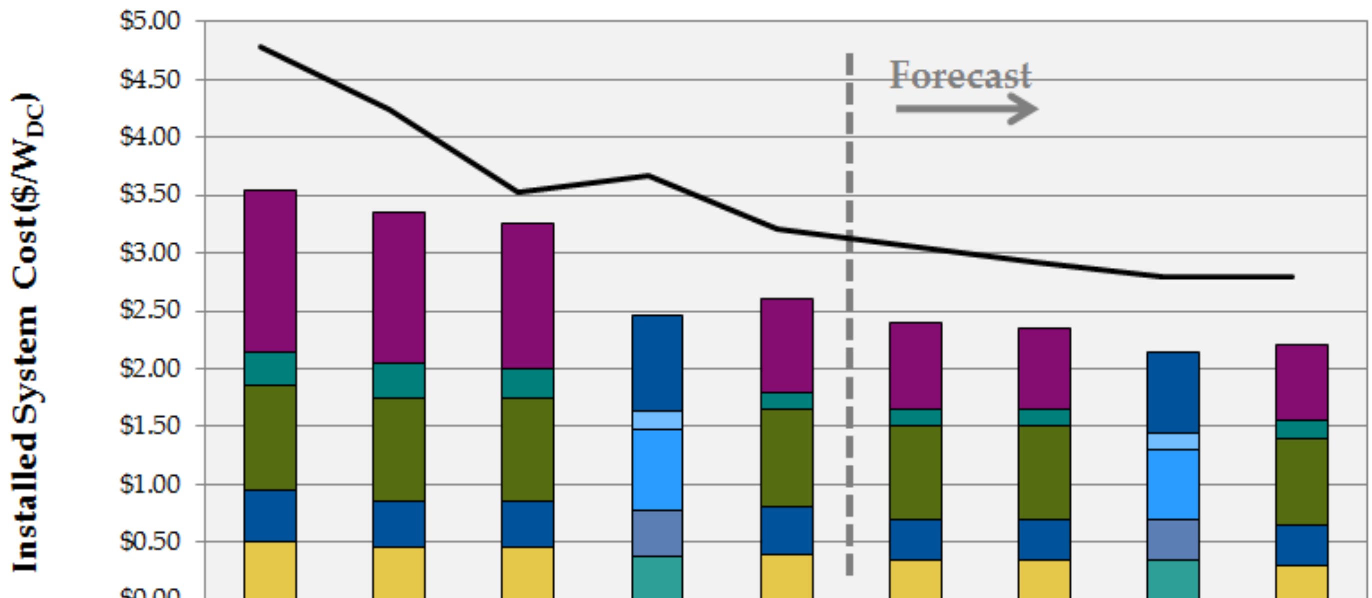
Utility Prices



	Tracking 2009	Tracking 2010	Tracking 2011	Fixed 2012	Tracking 2012	Tracking 2013	Tracking 2014	Fixed 2015	Tracking 2015
Total - Commercial	4.90	4.30	3.60	3.75	3.30	3.10	3.00	2.85	2.85
Total - Utility	3.55	3.35	3.25	2.46	2.60	2.40	2.35	2.15	2.20
Module	1.40	1.30	1.25	0.83	0.80	0.75	0.70	0.70	0.65
Inverter	0.30	0.30	0.25	0.16	0.15	0.15	0.15	0.15	0.15
Racking & BOS	0.90	0.90	0.90	0.70	0.85	0.80	0.80	0.60	0.75
Labor	0.45	0.40	0.40	0.40	0.40	0.35	0.35	0.35	0.35
Margin & OH	0.50	0.45	0.45	0.37	0.40	0.35	0.35	0.35	0.30

Source: Navigant Consulting / SEPA

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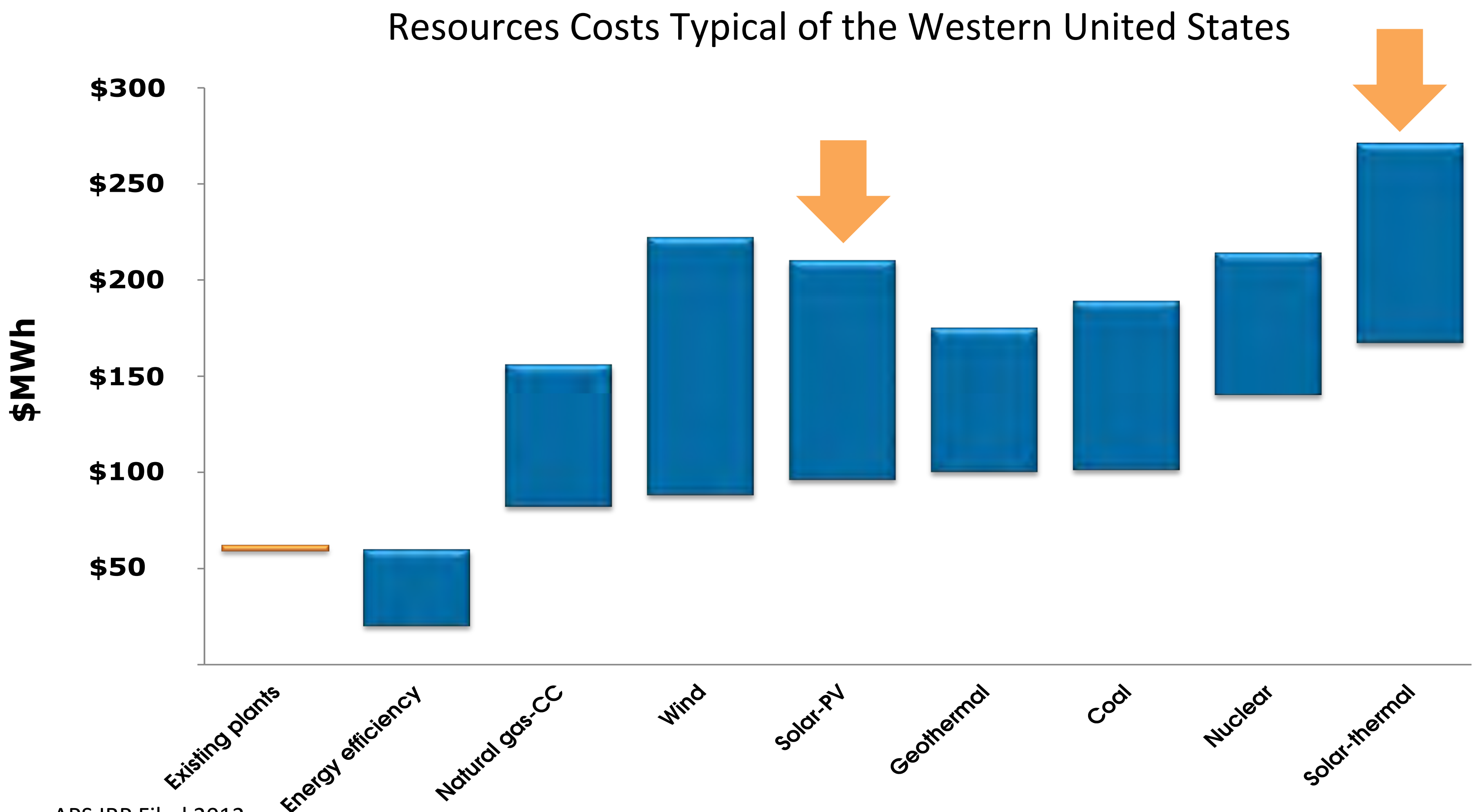
Price Comparison



Source: APS IRP Filed 2012

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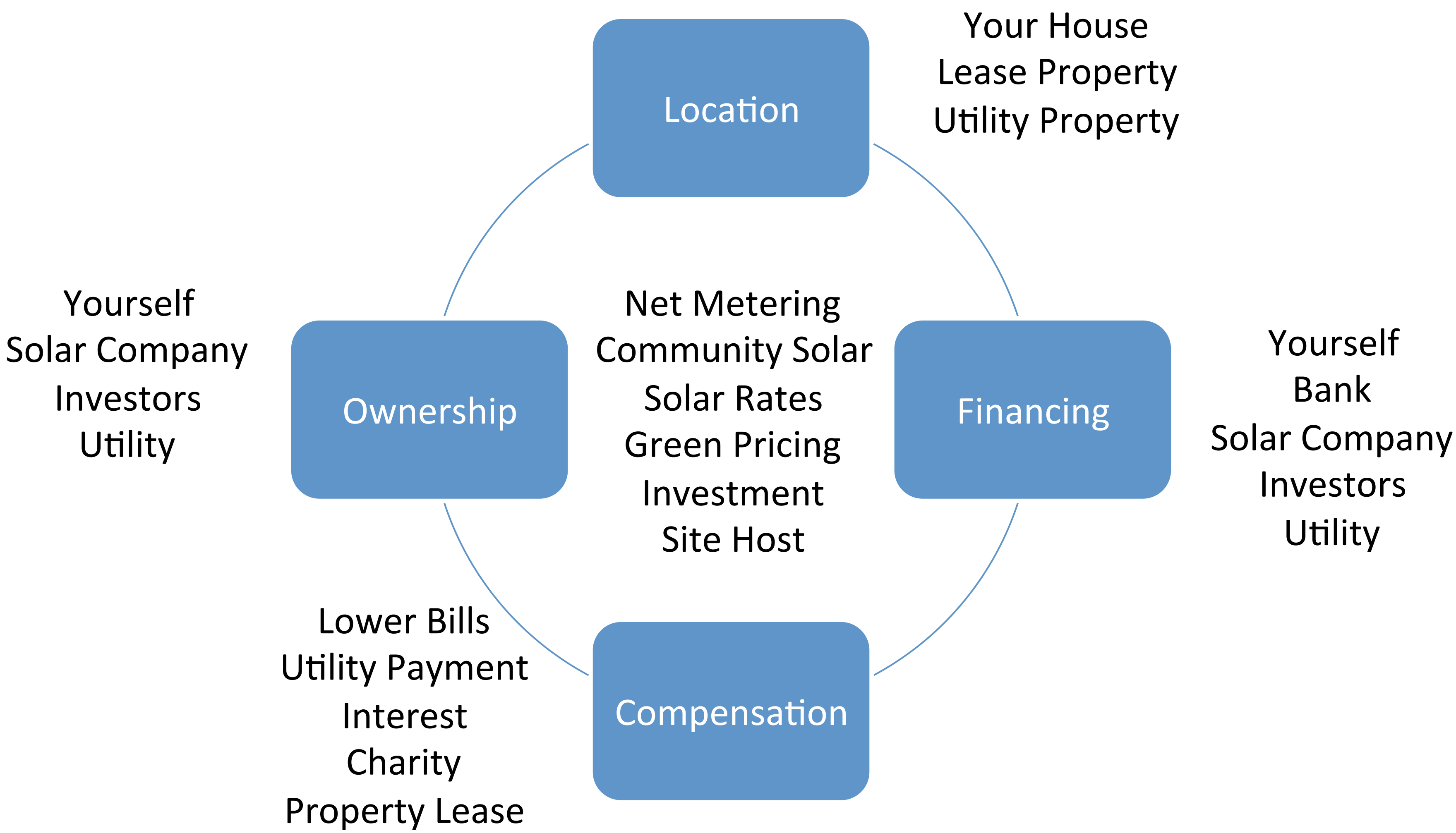
Consumer Choices



DSIRESOLAR™
Database of State Incentives for Renewables & Efficiency

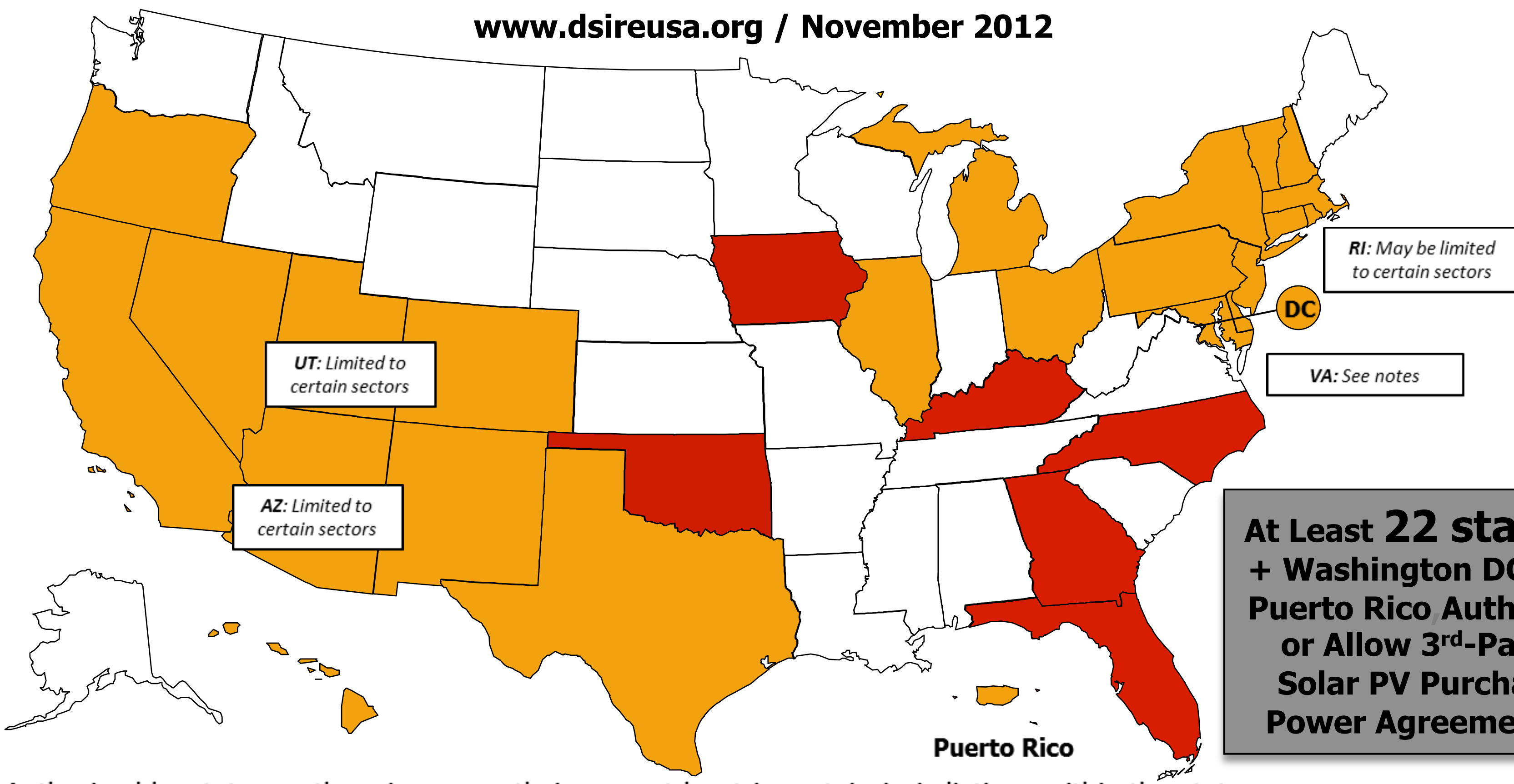
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

IREC Interstate Renewable Energy Council

North Carolina Solar Center

3rd-Party Solar PV Power Purchase Agreements (PPAs)

www.dsireusa.org / November 2012



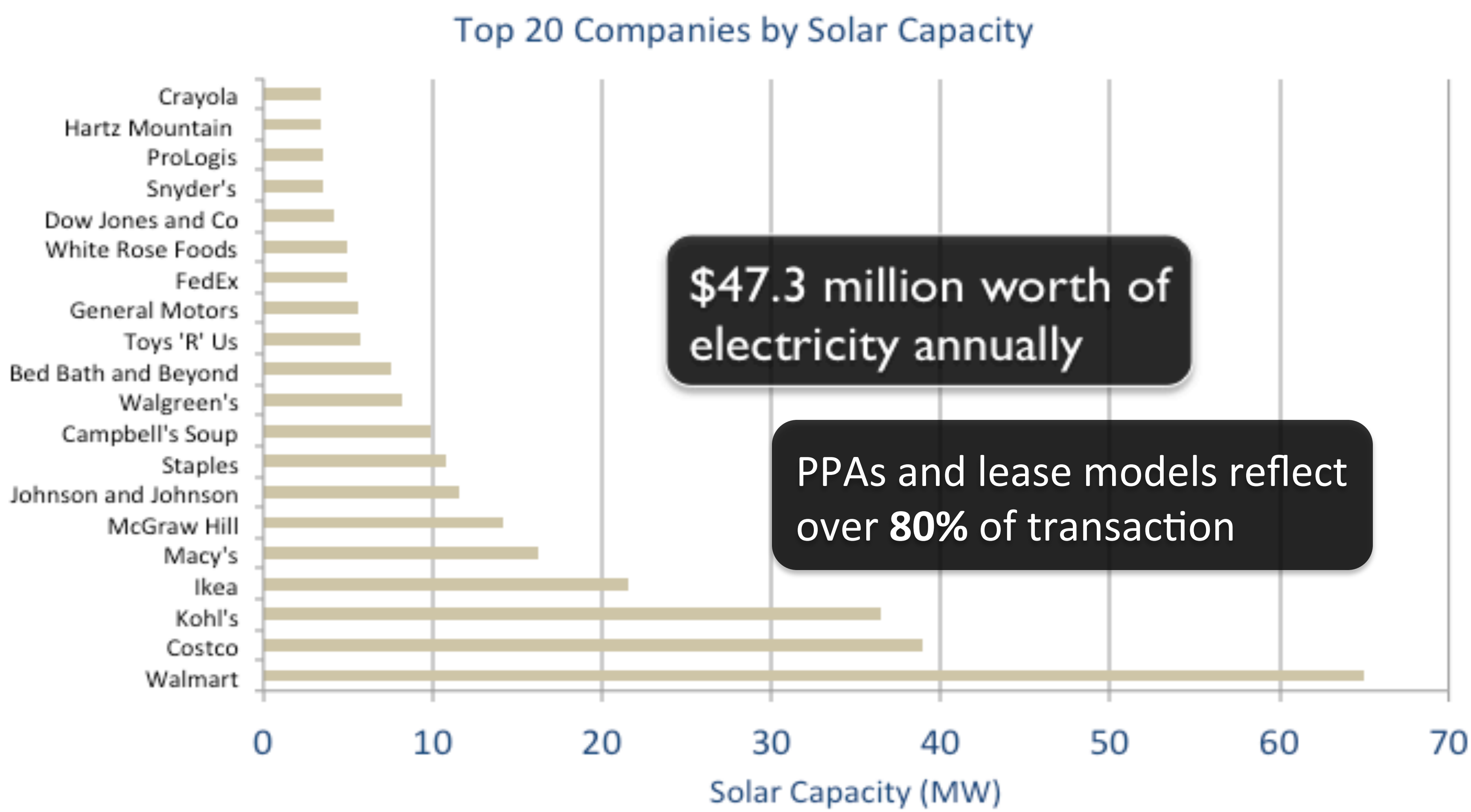
At Least 22 states + Washington DC and Puerto Rico Authorize or Allow 3rd-Party Solar PV Purchase Power Agreements

- Authorized by state or otherwise currently in use, at least in certain jurisdictions within the state
- Apparently disallowed by state or otherwise restricted by legal barriers
- Status unclear or unknown

Note: This map is intended to serve as an unofficial guide; it does not constitute legal advice. Seek qualified legal expertise before making binding financial decisions related to a 3rd-party PPA. See following slides for additional important information and authority references.

Customer Retention

Fueled by Favorable IRRs and Hedge Based-Drivers



Utility Community Solar

- One or more utility-managed photovoltaic projects from which customers can benefit from a fractional share of the electricity output
- The utility takes on risk for the customer (cost, maintenance, performance, etc) in exchange for enhancing utility and customer value:

Utility Value	Customer Value
Control deployment and contain costs	Flexibility to move within utility area
Available to more customers	Simple, customer friendly process
Lower cost than other incentive programs	No up-front or maintenance costs
Use towards renewable goals	Pricing benefits
Enhanced relationship with customer	Utility operates for customer

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Utility Community Solar

Examples

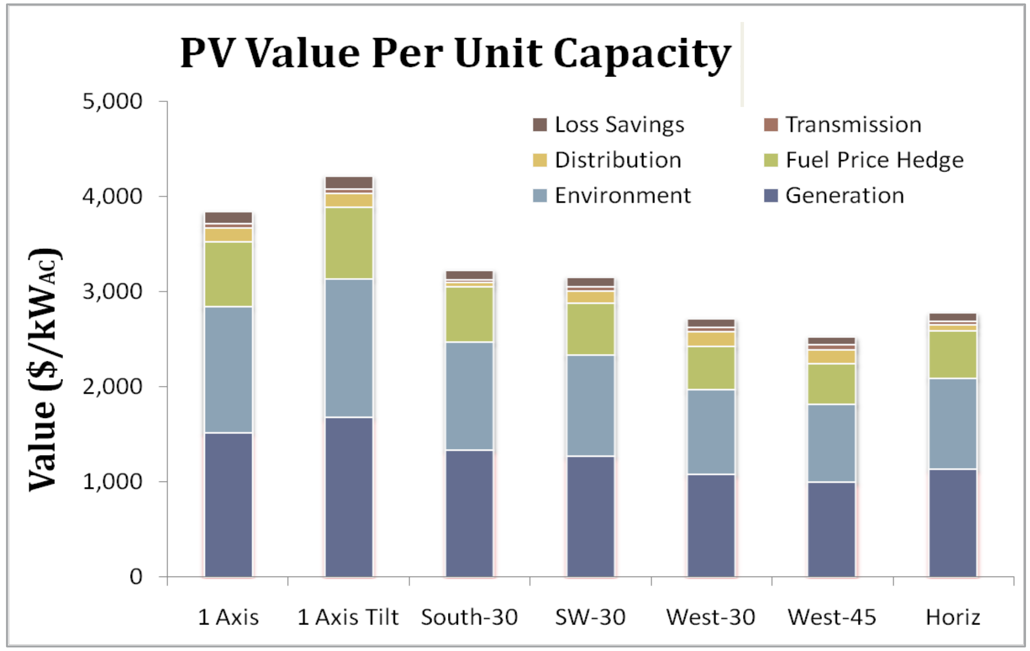
Utility Name/Location	Project Type	Program Size
City of St. George, UT	Utility Owned	100 kW
Orlando Utilities Commission, FL	PPA	900 kW
Salt River Project, AZ	PPA	20 MW
Seattle City Light, WA	Utility Owned	24 kW
Trico Electric Cooperative, AZ	Utility Owned	227 kW
Tucson Electric Power, AZ	Utility Owned	12.6 MW
TOTAL		33.8 MW

Source: SEPA

Utility Solar Rates

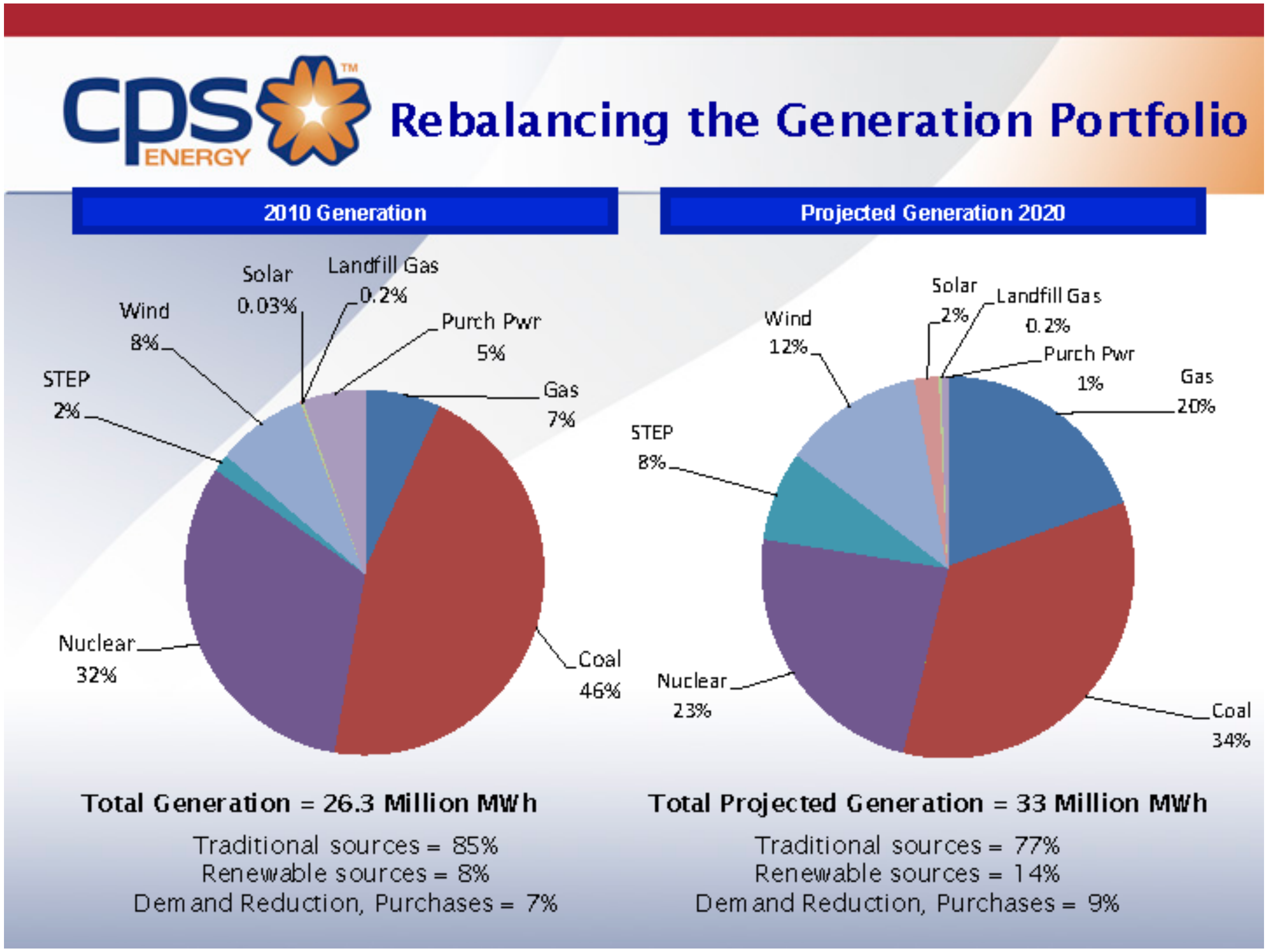
Utility value components

- Loss savings
- Energy
- Generation capacity
- Fuel price hedge
- T&D capacity
- Environmental



Locational high resolution solar data and system specific characteristics are necessary to fully capture the VOS, these are not easily obtained or economically repeated in-house without leveraging new planning models

Utility Planning



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Utility Ownership

Issues that pull utilities to ownership	Issues that push utilities from ownership
Favorable regulatory approval environment	Policies prohibiting or limiting utility ownership
Capital asset return on investment	Unfavorable regulatory approval environment
Federal investment tax credit	Lack of tax appetite
Declining cost of PV technologies	Investment tax credit normalization (for IOUs only)
Less contract debt (e.g. imputed debt)	Real or perceived technology risk
Reduced RPS compliance risk from third-party common issue areas	Construction cost risk
Future cost of PPA replacement	Construction schedule risk
Project flexibility	Operational risks
Control and integration	

2011: 13% of investing over $3 billion & 700+ MW

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Market Changes

Customer Market	Utility Market
Lower Solar Prices (+)	Lower Solar Prices (+)
Rising Electricity Rates (+)	Avoided Costs / Fuels (+/-)
Incentives (+ → -)	Risk Assessment (+/-)
More Solar Options (+)	Business Opportunity (+)

Closing Thoughts

Maintaining Parity and Delivering Solar

- PV deployment in the US will demonstrate continued steady growth, varying by state and utility market
- Customer interests, needs and actions will continue to accelerate
  - Net metering will drive utility rate and regulatory reform
- Utility resource planning should begin to reflect unique aspects of solar
- Utility innovations require utility leadership

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Thank You

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